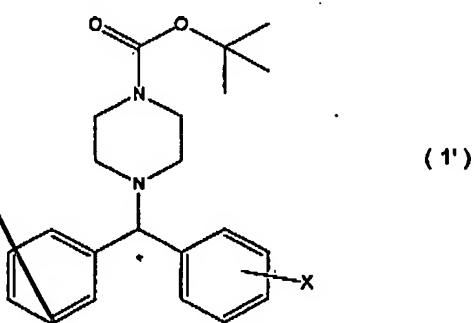


part A2

WHAT IS CLAIMED IS:

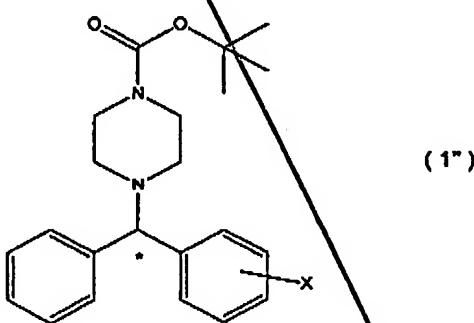
1. An optically active 4-(tert-butoxycarbonyl)piperazine compound of formula (1'):



wherein X denotes a chlorine atom, a C1-C3 alkyl group or a C1-C3 alkoxy group and * designate an asymmetric carbon atom.

10

2. A composition comprising
an optical isomer of formula (1"):

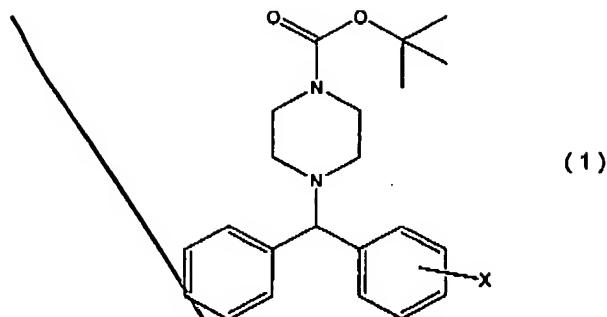


wherein X denotes a chlorine atom, a C1-C3 alkyl group or a C1-C3 alkoxy group and * designate an asymmetric carbon atom, and
an enantiomer thereof, in an optional ratio.

15

3. A 4-(tert-butoxycarbonyl)piperazine compound of formula (1):

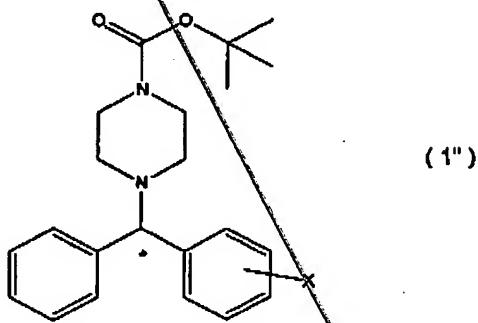
*A²
cont*



wherein X denotes a chlorine atom, a C1-C3 alkyl group or a C1-C3 alkoxy group.

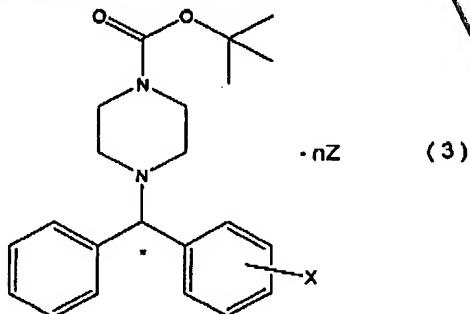
4. An optical isomer of formula (1''):

5



wherein X denotes a chlorine atom, a C1-C3 alkyl group or a C1-C3 alkoxy group and * designate an asymmetric carbon atom, or salts thereof.

10 5. An adduct salt of formula (3):

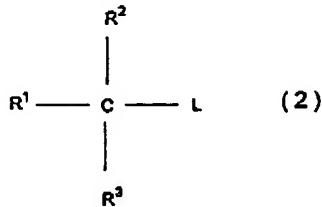


wherein X denotes a chlorine atom, a C1-C3 alkyl group or a C1-C3 alkoxy group and * designate an asymmetric carbon atom, n represents

*Q²
cont*

an integer of 1 or 2, and Z represents

an optically active acid of formula (2):



wherein L represents $-COOH$ or $-SO_3H$,

5 R^2 represents a hydrogen atom or a hydroxyl group,
 R^1 and R^3 are the same or different and each independently
 represent
 a hydrogen atom, a halogen atom, an arylcarbonyloxy group,
 a linear or branched alkyl group which may be substituted with at
10 least one group selected from a hydroxyl group, a halogen atom, an
 arylcarbonyloxy group, a carboxy group and an arylaminocarbonyl group;
 an aryl group which may be substituted with at least one group
 selected from a halogen atom, an alkyl group and an alkoxy group;
 an aralkyl group which may be substituted with at least one group
15 selected from a halogen atom, an alkyl group, an alkoxy group and a
 hydroxyl group;
 an aryloxy group which may be substituted with at least one
 group selected from a halogen atom, an alkyl group, an alkoxy group and
 a hydroxyl group;
20 a cyclic alkyloxy group which may be substituted with at least one
 group selected from a halogen atom, an alkyl group, an alkoxy group and
 a hydroxyl group; or
 a cyclic alkyl group which may be substituted with at least one
 group selected from a halogen atom, an alkyl group, an alkoxy group, a
25 hydroxyl group and a phenylcarbonylamino group; or
 R^1 and R^3 may be bonded together to form

*a 2
cont*

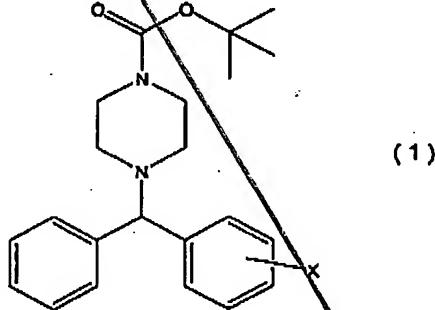
an alkylene group which may be substituted with at least one group selected from a halogen atom, an alkyl group, an alkoxy group, a carboxyl group, an oxo group, a hydroxyl group, and a phenylcarbonylamino group, or

a heterocycle which may be substituted with at least one group selected from an alkyl group, alkoxy or a halogen atom.

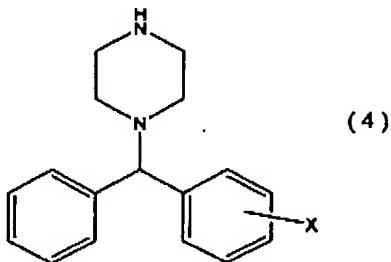
6. An adduct salt according to claim 5, wherein the acid of formula (2) is optically active O,O'-dibenzoyltartaric acid.

10 7. An adduct salt according to any one of claims 1, 2, 3, 4, 5, or 6, wherein X represents a chlorine atom at 4-position of the phenyl group.

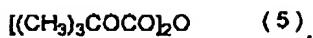
8. A process for producing a 4-(tert-butoxycarbonyl)piperazine compound of formula (1):



15 wherein X denotes a chlorine atom, a C1-C3 alkyl group or a C1-C3 alkoxy group, which comprises reacting 1-[(substituted phenyl)phenylmethyl]piperazine of formula (4):

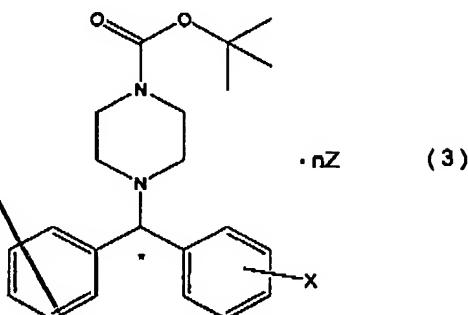


20 wherein X has the same meaning as defined above, with di-tert-butyl dicarbonate of formula (5):



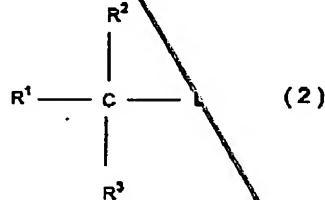
A²
cont

9. A process for producing an optically active adduct salt of formula (3):



5. wherein X denotes a chlorine atom, a C1-C3 alkyl group or a C1-C3 alkoxy group, * represents an asymmetric carbon atom, and n represents an integer of 1 or 2, and

Z represents an optically active acid of formula (2):



10. wherein L represents $-\text{COOH}$ or $-\text{SO}_3\text{H}$,

R^2 represents a hydrogen atom or a hydroxyl group;

R^1 and R^3 are the same or different and independently represent a hydrogen atom, a halogen atom, or an arylcarbonyloxy group; a linear or branched alkyl group which may be substituted with at

15. least one group selected from a hydroxyl group, a halogen atom, an arylcarbonyloxy group, a carboxy group and an arylaminocarbonyl group; an aryl group which may be substituted with at least one group selected from a halogen atom, an alkyl group and an alkoxy group; an aralkyl group which may be substituted with at least one group selected from a halogen atom, an alkyl group, an alkoxy group and a hydroxyl group;

*A²
Cont*

an aryloxy group which may be substituted with at least one group selected from a halogen atom, an alkyl group, an alkoxy group and a hydroxyl group;

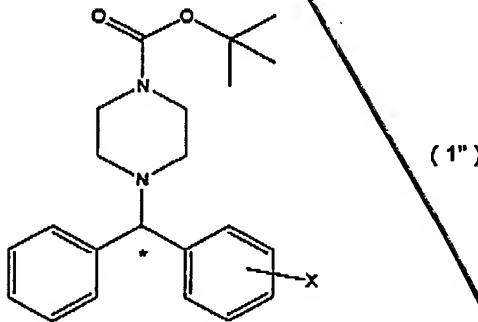
5 a cyclic alkyloxy group which may be substituted with at least one group selected from a halogen atom, an alkyl group, an alkoxy group and a hydroxyl group; or

10 a cyclic alkyl group which may be substituted with at least one group selected from a halogen atom, an alkyl group, an alkoxy group, a hydroxyl group and a phenylcarbonylamino group; or

15 R¹ and R³ may be bonded together to form an alkylene group which may be substituted with at least one group selected from a halogen atom, an alkyl group, an alkoxy group, a carboxyl group, an oxo group, a hydroxyl group, and a phenylcarbonylamino group, or

20 a heterocycle which may be substituted with at least one group selected from an alkyl group, an alkoxy group and a halogen atom,

which comprises reacting a composition comprising an optical isomer of 4-(tert-butoxycarbonyl)piperazine compound of formula (1''):



25 wherein X and * designate the same as defined above, and an enantiomer thereof, with an optically active acid of formula (2) as defined above.

10. A process according to claim 9, which further comprises recrystallizing the acid adduct salt of the optically active

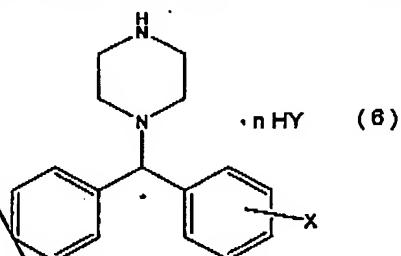
*A²
cont*

4-(tert-butoxycarbonyl)piperazine of formula (3).

11. A process according to claim 9 or 10, which further comprises reacting an adduct salt of formula (3), with a base to produce an optically active 4-(tert-butoxycarbonyl)piperazine of formula (1').

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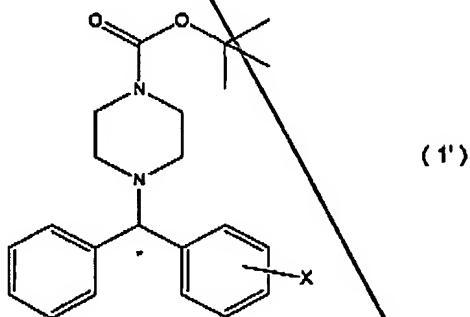
12. A process for producing an adduct salt of formula (6):



wherein X denotes a chlorine atom, a C1-C3 alkyl group or a C1-C3 alkoxy group, * represents an asymmetric carbon atom, and n represents an integer of 1 or 2,

10

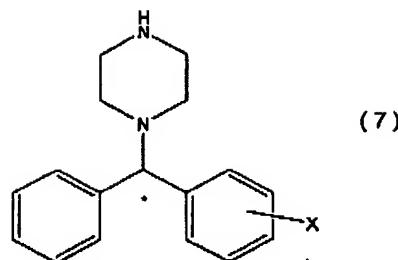
Y represents a halogen atom, $-\text{OSO}_3\text{H}$, $-\text{OSO}_2\text{CH}_3$, $-\text{OCOCF}_3$, $-\text{OCOCH}_3$ and $-\text{OCOH}$, which comprises reacting an optically active 4-(tert-butoxycarbonyl)piperazine of formula (1'):



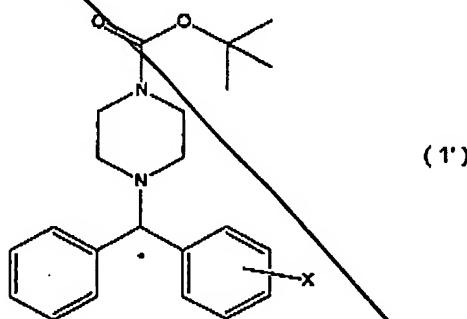
wherein X and * designate the same as defined above, with an acid of formula: HY, wherein Y represents the same as defined above.

15 13. A process for producing an optically active 1-[(substituted phenyl)phenylmethyl]piperazine of formula (7):

*a²
cont*



wherein X and * each have the same meaning as defined above, which process comprises reacting an optically active 4-(tert-butoxycarbonyl)piperazine compound of formula (1'):



5

wherein X denotes a chlorine atom, a C1-C3 alkyl group or a C1-C3 alkoxy group, * represents an asymmetric carbon atom, with an acid and subsequently with a base.